

CLAIMS:

1. A method for forwarding information in a multi-hop network having multiple nodes, said method comprising the steps of:
 - 5 - jointly selecting, for at least one transmitting node, i) relay node among multiple relay candidate nodes and ii) at least one of:
 - a) destination among multiple destinations represented in the transmit queue of said at least one transmitting node; and
 - b) flow among multiple flows represented in said at least one transmitting node;
 - 10 - selecting a set of information from the transmit queue of said at least one transmitting node based on at least one of selected destination and flow; and
 - transmitting the selected set of information to the selected relay node.
- 15 2. The method according to claim 1, wherein said step of jointly selecting further comprises selecting iii) at least one link parameter, and said step of transmitting the selected set of information to the selected relay node is performed based on said selected at least one link parameter.
- 20 3. The method according to claim 1, wherein said step of jointly selecting comprises the step of jointly selecting a combination of relay node and destination among said multiple relay nodes and said multiple destinations, and said step of selecting a set of information comprises the step of selecting a set of information heading for the selected destination from the transmit queue.
- 25 4. The method according to claim 1, wherein said step of jointly selecting comprises the step of jointly selecting a combination of relay node and flow among said multiple relay nodes and said multiple flows, and said step of selecting a set of information comprises the step of selecting a set of information belonging to the selected flow from the transmit queue.

5. The method according to claim 1, wherein said step of jointly selecting is performed based on information representing link performance between said at least one transmitting node and each one of said multiple relay candidate nodes.

5 6. The method according to claim 1, wherein said step of jointly selecting is performed based on optimization of an objective function that includes information cost progress.

7. The method according to claim 1, wherein said step of jointly selecting is 10 performed based on at least one quality of service (QoS) parameter.

8. The method according to claim 1, further comprising the steps of:

- said at least one transmitting node transmitting an interrogation message to said multiple relay candidate nodes in the network; and
- each one of said multiple relay candidate nodes replying, in response to said interrogation message, with a response message for said at least one transmitting node;

15 wherein said step of jointly selecting is performed at least partly based on said response messages from said multiple relay candidate nodes.

20 9. The method according to claim 8, further comprising the steps of:

- each one of said relay candidate nodes determining link performance representing information for the corresponding link between said at least one transmitting node and the relay candidate node based on the received interrogation message; and

25 - each one of said relay candidate nodes replying to said at least one transmitting node with a response message including said link performance representing information,

wherein said step of jointly selecting is performed at least partly based on said link performance representing information included in the response messages from said multiple relay candidate nodes.

5 10. The method according to claim 9, wherein said interrogation message is transmitted using at least one predetermined transmit parameter, and said selected set of information is subsequently transmitted to the selected relay node using substantially the same at least one predetermined transmit parameter that was used for transmission of the interrogation message.

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11. The method according to claim 10, wherein multiple transmitting nodes are operated for time-synchronized transmission of interrogation messages as well as time-synchronized transmission of information.

15 12. The method according to claim 10, wherein said at least one predetermined transmit parameter includes at least one of transmit power level and antenna weights.

13. The method according to claim 8, wherein said steps of transmitting an interrogation message, replying with a response message, jointly selecting and 20 forwarding information are performed within a period of time that has a shorter duration than the channel coherence time.

25 14. The method according to claim 8, wherein said at least one transmitting node determines, based on each received response message, link performance representing information for the corresponding link between said at least one transmitting node and the replying relay candidate node, and said step of jointly selecting is performed based on said link performance representing information.

30 15. The method according to claim 8, further comprising, for at least one of said relay candidate nodes, the steps of:

- receiving, from multiple transmitting nodes, corresponding interrogation messages;
 - determining, in response to each interrogation message, link performance information for the link between the corresponding transmitting node and the relay candidate node; and
 - replying, to at least one transmitting node associated with a link having relatively high link performance, with a response message comprising information on the corresponding link performance.
- 10 16. The method according to claim 1, further comprising the step of said selected relay candidate node replying, to said at least one transmitting node, with an acknowledgment confirming reception of said selected set of information.
- 15 17. The method according to claim 1, wherein said multi-hop network is a packet radio network.
18. A method for forwarding information in a multi-hop network having multiple nodes, said method comprising the steps of:
 - performing probing between a transmitting node and multiple relay candidate nodes, using at least one predetermined transmit parameter for probe transmission;
 - determining information representing link performance for links between said transmitting node and said relay candidate nodes based on said probing;
 - jointly selecting, based on said link performance representing information, a combination of:
 - i) relay node among said multiple relay candidate nodes,
 - ii) at least one of:
 - a) destination among multiple destinations represented in the transmit queue of said transmitting node; and
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- b) flow among multiple flows represented in said transmitting node; and
- iii) link mode scheme;
- selecting a set of information from the transmit queue of said at least one transmitting node based on at least one of selected destination and flow;
 - transmitting said selected set of information from said transmitting node to the selected relay node, using substantially the same at least one predetermined transmit parameter that was used for probe transmission and said selected link mode scheme.
- 10 19. A system for forwarding information in a multi-hop network having multiple nodes, said system comprising:
- means for jointly selecting, for at least one transmitting node, i) relay node among multiple relay candidate nodes and ii) at least one of:
 - a) destination among multiple destinations represented in the transmit queue of said at least one transmitting node; and
 - b) flow among multiple flows represented in said at least one transmitting node;
 - means for selecting a set of information from the transmit queue of said at least one transmitting node based on at least one of selected destination and flow;
 - means for transmitting the selected set of information to the selected relay node.
- 20 20. The system according to claim 19, wherein said means for jointly selecting is configured for further selecting iii) at least one link parameter, and said means for transmitting the selected set of information to the selected relay node is performed based on said selected at least one link parameter.
- 25 21. The system according to claim 19, wherein said means for jointly selecting is configured for jointly selecting a combination of relay node and destination among

said multiple relay nodes and said multiple destinations, and said means for selecting a set of information is configured for selecting a set of information heading for the selected destination from the transmit queue.

5 22. The system according to claim 19, wherein said means for jointly selecting is configured for jointly selecting a combination of relay node and flow among said multiple relay nodes and said multiple flows, and said means for selecting a set of information is configured for selecting a set of information belonging to the selected flow from the transmit queue.

10 23. The system according to claim 19, wherein said means for jointly selecting is configured to operate based on information representing link performance between said at least one transmitting node and each one of said multiple relay candidate nodes.

15 24. The system according to claim 19, wherein said means for jointly selecting is configured for optimization of an objective function that includes information cost progress.

20 25. The system according to claim 19, whercin said means for jointly selecting is configured to operate based on at least one quality of service (QoS) parameter.

26. The system according to claim 19, further comprising:

- means for transmitting an interrogation message from said at least one transmitting node to said multiple relay candidate nodes; and

25 - means, provided in each one of said relay candidate nodes, for replying, in response to said interrogation message, with a response message for said at least one transmitting node;

whercin said means for jointly selecting is configured to operate at least partly based on said response messages from said multiple relay candidate nodes.

27. The system according to claim 26, further comprising:

- means, provided in each one of said relay candidate nodes, for determining link performance representing information for the corresponding link between said at least one transmitting node and the relay candidate node based on the received interrogation message; and

- means, provided in each one of said relay candidate nodes, for replying to said at least one transmitting node with a response message including said link performance representing information,

wherein said means for jointly selecting is configured to operate at least partly based on said link performance representing information included in the response messages from said multiple relay candidate nodes.

28. The system according to claim 27, wherein said means for transmitting an interrogation message is configured to transmit said interrogation message using at least one predetermined transmit parameter, and said means for transmitting a selected set of information is configured to transmit said set of information to the selected relay node using substantially the same at least one predetermined transmit parameter that was used for transmission of the interrogation message.

29. The system according to claim 28, wherein multiple transmitting nodes are operated for time-synchronized transmission of interrogation messages as well as time-synchronized transmission of information.

30. The system according to claim 28, wherein said at least one predetermined transmit parameter includes at least one of transmit power level and antenna weights.

31. The system according to claim 26, wherein the three phases of interrogation, response and forwarding for a specific set of information are performed within a period of time that has a shorter duration than the channel coherence time.

32. The system according to claim 26, wherein said at least one transmitting node comprises means for determining, based on each received response message, link performance representing information for the corresponding link between said at least one transmitting node and the replying relay candidate node, and said means for jointly selecting is configured to operate based on said link performance representing information.
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33. The system according to claim 26, wherein said at least one transmitting node further comprises means for implicitly addressing at least one of said multiple relay candidate nodes based on an indication that it is a neighbor of an explicitly addressed relay candidate node.
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34. The system according to claim 26, wherein at least one of said relay candidate nodes receives interrogation messages from multiple transmitting nodes, and said at least one relay candidate node comprises:
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- means for determining, in response to each interrogation message, link performance information for the link between the corresponding transmitting node and the relay candidate node; and
 - means for replying, to at least one transmitting node associated with a link having relatively high link performance, with a response message comprising information on the corresponding link performance.
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35. The system according to claim 19, further comprising means for replying from the selected relay candidate node to said at least one transmitting node with an acknowledgment confirming reception of said selected set of information.
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36. The system according to claim 20, wherein said at least one link parameter includes parameters representing modulation and coding scheme.

37. The system according to claim 19, wherein said multi-hop network is a packet radio network.
38. A communication node in a packet radio multi-hop network, said communication node comprising:
- means for jointly selecting i) relay node among multiple relay candidate nodes and ii) at least one of:
 - a) destination among multiple destinations represented in the transmit queue of said communication node; and
 - b) flow among multiple flows represented in said communication node;
 - means for selecting a set of information from the transmit queue of said communication node based on at least one of selected destination and flow;
 - means for transmitting the selected set of information to the selected relay node.
39. The communication node according to claim 38, wherein said means for jointly selecting is configured for further selecting iii) at least one link parameter, and said means for transmitting the selected set of information to the selected relay node is performed based on said selected at least one link parameter.
40. The communication node according to claim 38, wherein said means for jointly selecting is configured for jointly selecting a combination of relay node and destination among said multiple relay nodes and said multiple destinations, and said means for selecting a set of information is configured for selecting a set of information heading for the selected destination from the transmit queue.
41. The communication node according to claim 38, wherein said means for jointly selecting is configured for jointly selecting a combination of relay node and flow among said multiple relay nodes and said multiple flows, and said means for selecting

a set of information is configured for selecting a set of information belonging to the selected flow from the transmit queue.

42. The communication node according to claim 38, wherein said means for jointly selecting is configured to operate based on information representing link performance between said communication node and each one of said multiple relay candidate nodes.

43. The communication node according to claim 38, further comprising means for transmitting an interrogation message from said at least one transmitting node to said multiple relay candidate nodes, wherein said means for jointly selecting is configured to operate at least partly based on interrogation response messages received from said multiple relay candidate nodes.

44. The communication node according to claim 43, further comprising means for implicitly addressing at least one of said multiple relay candidate nodes based on an indication that it is a neighbor of an explicitly addressed relay candidate node.

45. The communication node according to claim 39, wherein said at least one link parameter includes parameters representing modulation and coding scheme.

46. A communication node in a packet radio multi-hop network, said communication node comprising:

- means for jointly selecting a set of data among the data buffered in the transmit queue of said communication node and relay node among multiple relay candidate nodes; and

- means for transmitting the selected set of data to the selected relay node.

47. A communication node in a packet radio multi-hop network, said communication node comprising:

- means for jointly selecting, for at least one transmitting node, i) relay node among multiple relay candidate nodes and ii) at least one of:

a) destination among multiple destinations represented in the transmit queue of said at least one transmitting node; and

5 b) flow among multiple flows represented in said at least one transmitting node; and

iii) modulation and coding scheme;

- means for selecting a set of information from the transmit queue of said at least one transmitting node based on at least one of selected destination and flow;

10 - means for transmitting the selected set of information to the selected relay node based on said selected modulation and coding scheme.

48. A communication node in a packet radio multi-hop network, said communication node comprising:

15 - means for jointly selecting, for at least one transmitting node, i) relay node among multiple relay candidate nodes and ii) at least one of:

a) destination among multiple destinations represented in the transmit queue of said at least one transmitting node; and

20 b) flow among multiple flows represented in said at least one transmitting node; and

iii) at least one frequency channel among multiple frequency channels;

- means for selecting a set of information from the transmit queue of said at least one transmitting node based on at least one of selected destination and flow;

25 - means for transmitting the selected set of information to the selected relay node on said selected at least one frequency channel.

49. A control node in a packet radio multi-hop network, said control node comprising:

30 - means for jointly selecting, for at least one transmitting node in the multi-hop network, a combination of relay node among multiple relay candidate nodes

and destination node among multiple destination nodes represented in the transmit queue of said at least one transmitting node; and

- means for transmitting information on the selected destination node and relay node to said at least one transmitting node, thereby enabling forwarding of data 5 heading for the selected destination node from said at least one transmitting node to the selected relay node.

50. A control node in a packet radio multi-hop network, said control node comprising:

10 - means for jointly selecting, for at least one transmitting node in the multi-hop network, a combination of relay node among multiple relay candidate nodes and flow among multiple flows represented in said at least one transmitting node; and
- means for transmitting information on the selected flow and relay node to said at least one transmitting node, thereby enabling forwarding of data associated 15 with the selected flow from said at least one transmitting node to the selected relay node.
